

BOLIN'S MEADOW WEST SUB.  
DRAINAGE CALCS.

SHT. 10E13

PROPOSED DEVELOPMENT: 18 AC SINGLE FAMILY RESIDENTIAL  
SUBDIVISION ON BROADWAY AVE.

PROPOSED DRAINAGE PLAN: RUNOFF FROM THE SITE AND APPROXIMATELY 5 ACRES OF ADJOINING LANDS WILL BE COLLECTED IN INLETS AND DISCHARGED THROUGH PIPES TO A DITCH ALONG THE SOUTH SIDE OF THE SITE. THE EXISTING DITCH, WHICH DRAINS APPROXIMATELY 220 ACRES, WILL BE RELOCATED TO THE SOUTHERLY BOUNDARY OF THE SITE. THE DITCH DISCHARGES THROUGH A 3' x 3' BOX CULVERT UNDER BROADWAY AVE, JUST WEST OF THE PROPOSED ENTRANCE TO THE SUBDIVISION.

SITE DRAINAGE:

INLET #1:

$$A_{DR} = 7.9 \text{ AC.}$$

$$\frac{i}{P} = \frac{0.007 (KL)^{0.8}}{P_2^{0.5} S}$$

$$= 0.34 \text{ Hr}$$

$$n = 0.24$$

$$L = 300'$$

$$P_2 = 3.3''$$

$$S = 0.073 \text{ FT/FT}$$

$$t_{T_2} = \frac{L}{3600 V}$$

$$= -0-$$

$$L = 100' \text{ (UNPAVED)}$$

$$S = 0.16 \text{ FT/FT}$$

$$V = 6.5 \text{ FPS}$$

$$t_{T_3} = \frac{L}{3600 V}$$

$$= 0.07 \text{ Hr}$$

$$L = 950' \text{ (PAVED)}$$

$$S = 0.036 \text{ FT/FT}$$

$$V = 3.3 \text{ FPS}$$

$$\therefore t_c = 0.34 + 0 + 0.07$$

$$= 0.41 \text{ Hr} = 24.6 \text{ MIN. USE 25 MIN}$$

$$I = 3.7 \text{ "/hr}$$

$$C = 0.50$$

$$\begin{aligned} \therefore Q &= CIA \\ &= 0.50(3.7)(7.9) \\ &= 14.6 \text{ cfs} \end{aligned}$$

Use 21" RCP @ 0.7%

Inlet # 2:

$$A_{RCP} = 13.4 \text{ Ac}$$

$$t_c = 25 \text{ min. (Time in pipe is negligible)}$$

$$I = 3.7 \text{ "/hr}$$

$$C = 0.50$$

$$\begin{aligned} \therefore Q &= CIA \\ &= 0.50(3.7)(13.4) \\ &= 24.8 \text{ cfs} \end{aligned}$$

Use 24" RCP @ 1.0%

Inlet # 3:

$$A_{RCP} = 4.4 \text{ Ac.}$$

$$t_{T_1} = 0.34 \text{ (Same as for Inlet # 1)}$$

$$t_{T_2} = 0 \text{ ( " " " " " )}$$

$$\begin{aligned} t_{T_3} &= \frac{3600V}{L} \\ &= 0.06 \text{ hr} \end{aligned}$$

$$\begin{aligned} L &= 850' \text{ (Paved)} \\ S &= 0.042 \text{ FT/FT} \\ V &= 4.2 \text{ fps} \end{aligned}$$

$$\begin{aligned} \therefore t_c &= 0.34 + 0 + 0.06 \\ &= 0.40 \text{ hr} = 24 \text{ min} \end{aligned}$$

$$I = 3.8 \text{ "/hr}$$

$$C = 0.50$$

$$\begin{aligned} \therefore Q &= CIA \\ &= 0.50(3.3)(4.4) \\ &= 8.4 \text{ cfs} \end{aligned}$$

Use = 15" RCP @ 1.5%

INLET #4:

$$\begin{aligned} \text{AREA} &= 0.3 \text{ Ac} \\ t_{T1} &= \frac{0.007(nL)^{0.3}}{P_2^{0.5} S^{0.2}} \\ &= 0.17 \text{ Hr} \end{aligned}$$

$$\begin{aligned} n &= 0.24 \\ L &= 150' \\ P_2 &= 3.3' \\ S &= 0.015 \text{ ft/ft} \end{aligned}$$

$$\begin{aligned} t_{T2} &= \frac{L}{3600V} \\ &= 0.03 \text{ Hr} \end{aligned}$$

$$\begin{aligned} L &= 400' \text{ (PAVED)} \\ S &= 0.03 \text{ ft/ft} \\ V &= 3.5 \text{ fps} \end{aligned}$$

$$\begin{aligned} \therefore t_c &= 0.17 + 0.03 \\ &= 0.20 \text{ Hr} = 12 \text{ MIN} \end{aligned}$$

$$\begin{aligned} I &= 5.2 \text{ "/Hr} \\ C &= 0.50 \end{aligned}$$

$$\begin{aligned} \therefore Q &= CIA \\ &= 0.50(5.2)(0.8) \\ &= 2.1 \text{ cfs} \end{aligned}$$

Use = 12" RCP @ 0.3%

INLET #5

$$\text{AREA} = 5.6 \text{ Ac.}$$

$$t_c = 24 \text{ MIN. (TIME IN PIPE IS NEGLIGIBLE)}$$

$$\begin{aligned} I &= 3.8 \text{ "/Hr} \\ C &= 0.50 \end{aligned}$$

$$\begin{aligned} \therefore Q &= CIA \\ &= 0.50 (3.8) (5.6) \\ &= 10.6 \text{ cfs} \end{aligned}$$

Use 18" RCP @ 0.02%

DITCH:

$$\begin{aligned} \text{AREA} &= 220 \text{ sq. ft.} \\ T_1 &= \frac{0.007 (KL)^{0.54}}{1.49} \end{aligned}$$

$$= 0.43 \text{ hr}$$

$$\begin{aligned} n &= 0.024 \\ L &= 200' \\ P &= 3.2' \\ S &= 0.02 \text{ ft/ft} \end{aligned}$$

$$\begin{aligned} T_2 &= \frac{1}{3.000} \\ &= 0.09 \text{ hr} \end{aligned}$$

$$\begin{aligned} L &= 1200' \text{ (unpaved)} \\ S &= 0.05 \text{ ft/ft} \\ n &= 0.06 \text{ ft/ft} \end{aligned}$$

$$\begin{aligned} T_3 &= \frac{1}{3.000} \\ &= 0.21 \text{ hr} \end{aligned}$$

$$\begin{aligned} L &= 8500' \text{ (0.50)} \\ S &= 0.013 \text{ ft/ft} \\ n &= 0.04 \end{aligned}$$

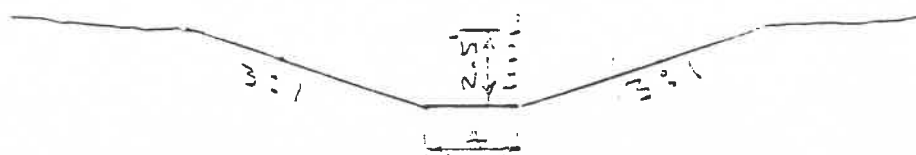
$$\begin{aligned} \therefore T_c &= 0.43 + 0.09 + 0.21 \\ &= 0.73 \text{ hr} \quad \text{Use } 0.75 \text{ hr} \\ CN &= 68 \end{aligned}$$

FROM COMPUTER GENERATED HYDROGRAPHS

$$Q_{25} = 183 \text{ cfs}$$

$$Q_{100} = 252 \text{ cfs}$$

DITCH X-SECTION



$$S = 0.012 \text{ FT/FT.}$$

## CAPACITY OF 5' X 8.5' BOX CULVERT

FOR CULVERT FLOWING FULL AT OUTLET

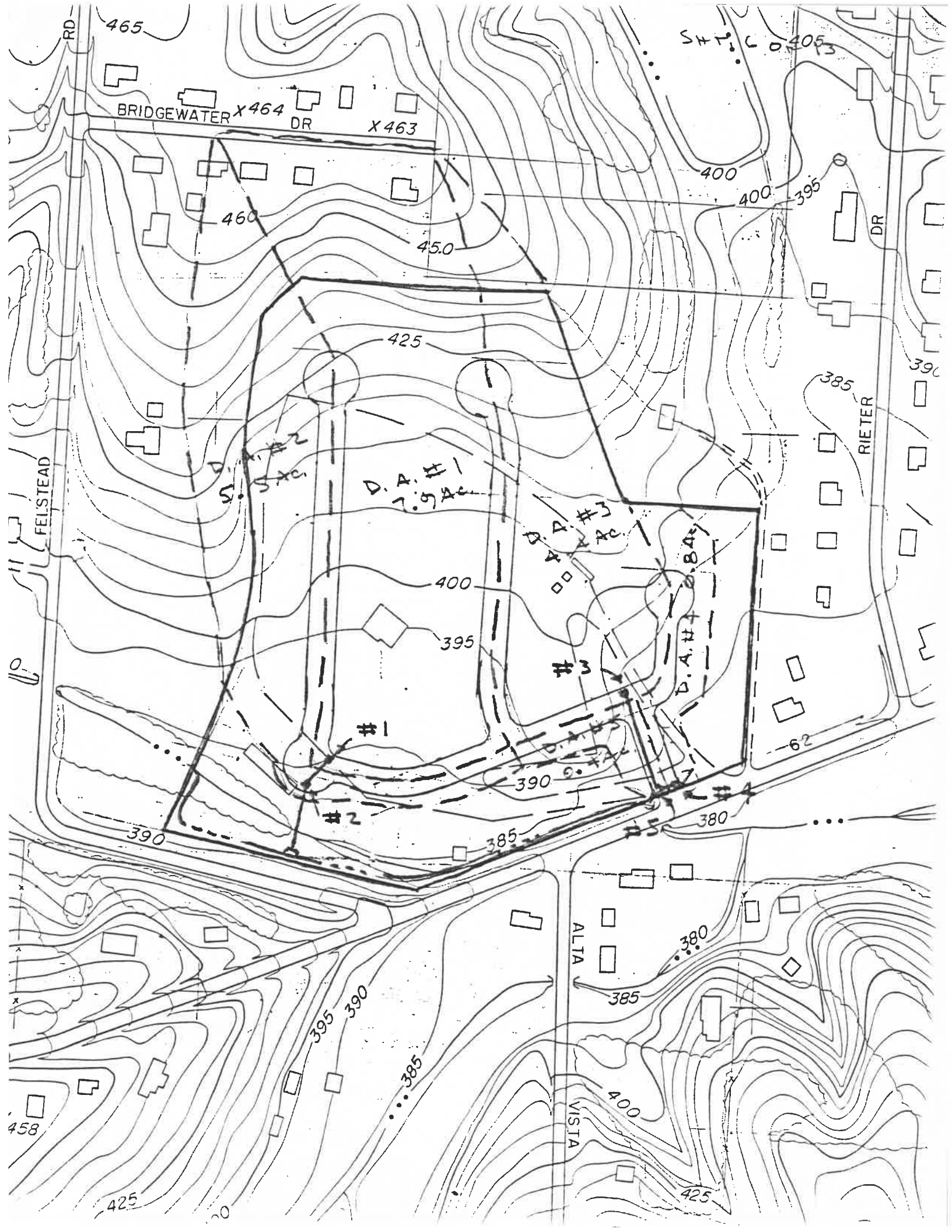
ELEVATION OF HEADWATER AT INLET

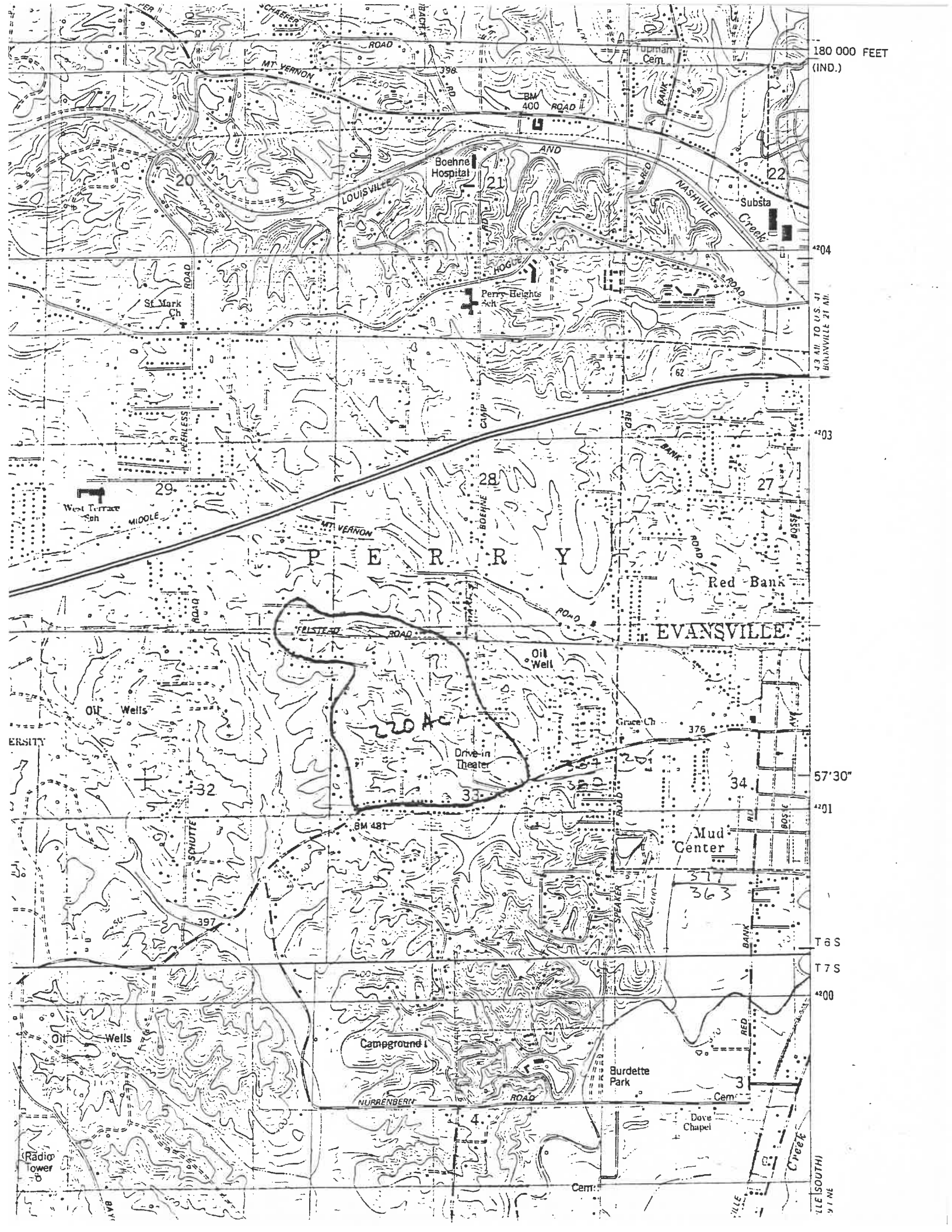
FOR 25 YEAR STORM IS 384.4

ELEVATION FOR 100 YEAR STORM IS 384.8

ELEVATION OF ROAD  $\pm$  AT CULVERT

IS 384.98.





180 000 FEET  
(IND.)

4204

73 AM TO U.S. 41  
BOONVILLE 21 AM.

4203

57°30"

4201

T 6 S

T 7 S

4200

116 SOUTH  
9 1 N E

Worksheet 2: Runoff curve number and runoff

SHT. 8 OF 13

Project BOLIN'S MEADOW WEST SUB By \_\_\_\_\_ Date \_\_\_\_\_

Location BROADWAY AVE. Checked \_\_\_\_\_ Date \_\_\_\_\_

Circle one: Present Developed

1. Runoff curve number (CN)

Soil name and hydrologic group (appendix A)	Cover description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN <sup>1/</sup>			Area <input checked="" type="checkbox"/> acres <input type="checkbox"/> mi. <sup>2</sup> <input type="checkbox"/> %	Product of CN x area
		Table 2-2	Fig. 2-3	Fig. 2-4		
B	RESIDENTIAL - 2 ACRES	65			148	9620
C	RESIDENTIAL - 2 ACRES	77			49	3773
E	RESIDENTIAL - 1/3 ACRES	72			17	1224
C	RESIDENTIAL - 1/3 ACRES	81			6	486
Totals =					220	15103

<sup>1/</sup> Use only one CN source per line.

CN (weighted) =  $\frac{\text{total product}}{\text{total area}}$  = \_\_\_\_\_ ;

Use CN = 63

2. Runoff

Frequency ..... yr  
 Rainfall, P (24-hour) ..... in  
 Runoff, Q ..... in  
 (Use P and CN with table 2-1, fig. 2-1, or eqs. 2-3 and 2-4.)

Storm #1	Storm #2	Storm #3
25	100	
5.5	6.5	



## SANTA BARBARA URBAN HYDROGRAPH

DATE: May 5, 1988

PROJECT NAME

MEADOW WEST

ENGINEER'S NAME

AREA (A)	220.00	Acres
CURVE NUMBER (CN)	68.00	
TIME OF CONCENTRATION (Tc)	0.75	Hours
DISTRIBUTION TYPE	SCS Type II	
RETURN FREQUENCY	25.00	Years
RAINFALL DURATION	24.00	Hours
24 HOUR RAINFALL (P24)	5.50	Inches
REPORTING INTERVAL (RI)	0.50	Hours

S = 4.7 Inches

K = 0.25

TIME (HR)	P/P24	RAINFALL P (IN)	RUNOFF R (IN)	INSTANT RUNOFF I (CFS)	RUNOFF HYDROGRAPH Q (CFS)
0.0	0.000	0.00	0.00	0.00	0.00
0.5	0.005	0.03	0.00	0.00	0.00
1.0	0.011	0.06	0.00	0.00	0.00
1.5	0.017	0.09	0.00	0.00	0.00
2.0	0.022	0.12	0.00	0.00	0.00
2.5	0.029	0.16	0.00	0.00	0.00
3.0	0.035	0.19	0.00	0.00	0.00
3.5	0.042	0.23	0.00	0.00	0.00
4.0	0.048	0.26	0.00	0.00	0.00
4.5	0.056	0.31	0.00	0.00	0.00
5.0	0.064	0.35	0.00	0.00	0.00
5.5	0.072	0.40	0.00	0.00	0.00
6.0	0.080	0.44	0.00	0.00	0.00
6.5	0.090	0.50	0.00	0.00	0.00
7.0	0.100	0.55	0.00	0.00	0.00
7.5	0.110	0.61	0.00	0.00	0.00
8.0	0.120	0.66	0.00	0.00	0.00
8.5	0.134	0.74	0.00	0.00	0.00
9.0	0.147	0.81	0.00	0.00	0.00
9.5	0.163	0.90	0.00	0.00	0.00
10.0	0.181	1.00	0.00	0.27	0.07
10.5	0.204	1.12	0.01	2.67	0.77
11.0	0.235	1.29	0.02	7.79	3.00
11.5	0.283	1.56	0.07	20.57	8.59
12.0	0.663	3.65	0.99	403.20	110.24
12.5	0.735	4.04	1.23	107.55	182.81
13.0	0.772	4.25	1.36	57.83	132.75
13.5	0.799	4.39	1.46	43.20	91.63
14.0	0.820	4.51	1.54	34.15	65.16
14.5	0.835	4.59	1.60	24.68	47.28
15.0	0.850	4.68	1.65	24.90	36.04
15.5	0.865	4.76	1.71	25.12	30.52
16.0	0.880	4.84	1.77	25.34	27.88
16.5	0.889	4.89	1.80	15.30	24.10
17.0	0.898	4.94	1.84	15.38	19.72

17.5	0.907	4.99	1.87	15.45	17.57
18.0	0.916	5.04	1.91	15.52	16.53
18.5	0.925	5.09	1.94	15.59	16.04
19.0	0.934	5.14	1.98	15.66	15.83
19.5	0.943	5.19	2.01	15.73	15.76
20.0	0.952	5.24	2.05	15.79	15.76
20.5	0.958	5.27	2.07	10.57	14.47
21.0	0.964	5.30	2.10	10.59	12.53
21.5	0.970	5.34	2.12	10.62	11.57
22.0	0.976	5.37	2.15	10.65	11.10
22.5	0.982	5.40	2.17	10.68	10.88
23.0	0.988	5.43	2.19	10.71	10.79
23.5	0.994	5.47	2.22	10.73	10.75
24.0	1.000	5.50	2.24	10.76	10.75

SANTA BARBARA URBAN HYDROGRAPH

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DATE: May 5, 1988

PROJECT NAME MEADOW WEST

ENGINEER'S NAME

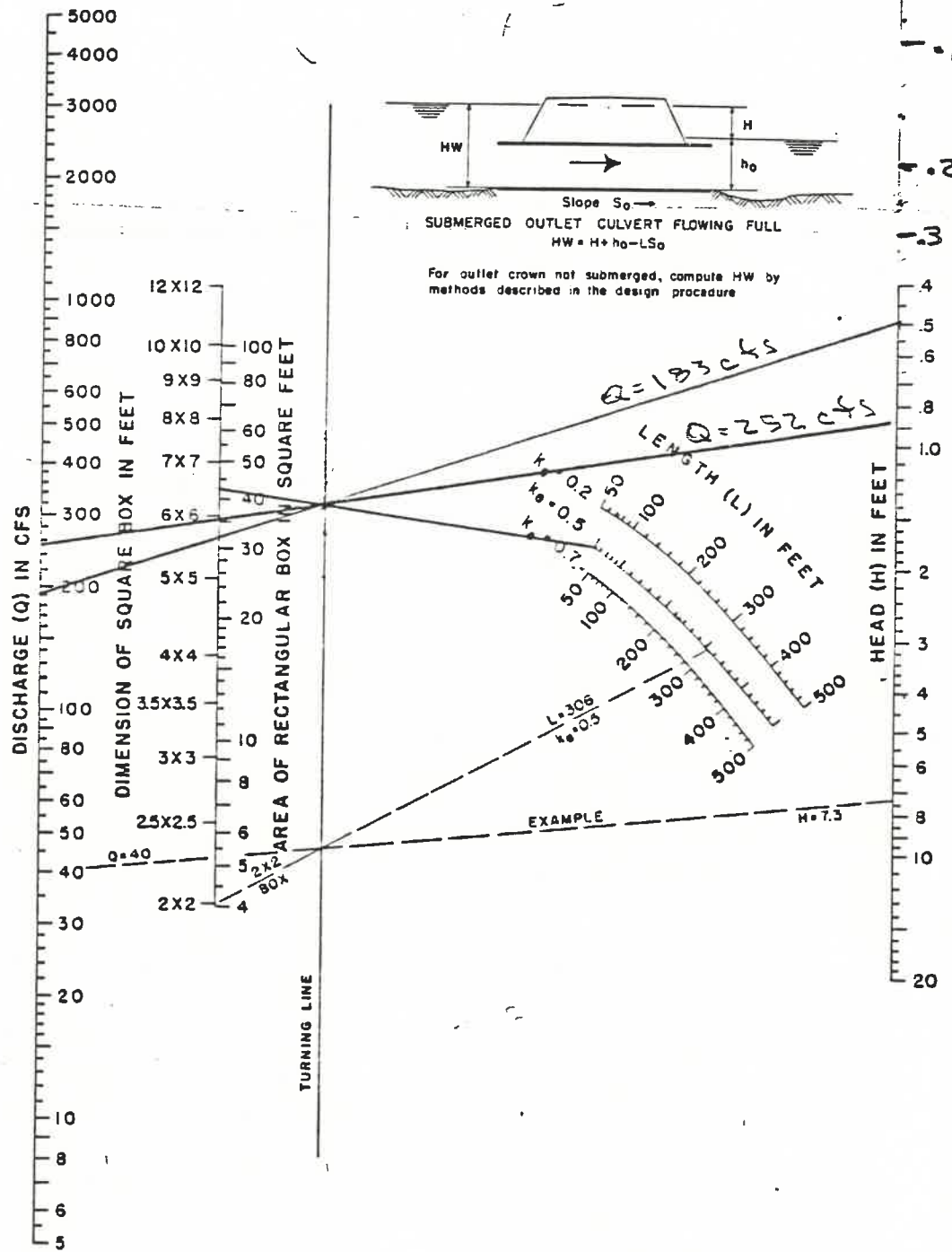
AREA (A) ..... 220.00 ..... Acres  
 CURVE NUMBER (CN) ..... 68.00 .....  
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 DISTRIBUTION TYPE ..... SCS Type II .....  
 RETURN FREQUENCY ..... 100.00 ..... Years  
 RAINFALL DURATION ..... 24.00 ..... Hours  
 24 HOUR RAINFALL (P24) ..... 6.50 ..... Inches  
 REPORTING INTERVAL (RI) ..... 0.50 ..... Hours

S = 4.7 Inches K = 0.25

TIME (HR)	P/P24	RAINFALL P (IN)	RUNOFF R (IN)	INSTANT RUNOFF I (CFS)	RUNOFF HYDROGRAPH Q (CFS)
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5.0	0.064	0.42	0.00	0.00	0.00
5.5	0.072	0.47	0.00	0.00	0.00
6.0	0.080	0.52	0.00	0.00	0.00
6.5	0.090	0.59	0.00	0.00	0.00
7.0	0.100	0.65	0.00	0.00	0.00
7.5	0.110	0.72	0.00	0.00	0.00
8.0	0.120	0.78	0.00	0.00	0.00
8.5	0.134	0.87	0.00	0.00	0.00
9.0	0.147	0.96	.00	0.02	.00
9.5	0.163	1.06	.00	1.26	0.32
10.0	0.181	1.18	0.01	3.65	1.39
10.5	0.204	1.33	0.03	7.87	3.58
11.0	0.235	1.53	0.06	15.78	7.70
11.5	0.283	1.84	0.14	34.78	16.49
12.0	0.663	4.31	1.41	554.91	155.67
12.5	0.735	4.78	1.72	139.80	251.51
13.0	0.772	5.02	1.89	74.58	179.35
13.5	0.799	5.19	2.02	55.48	122.19
14.0	0.820	5.33	2.12	43.73	85.90
14.5	0.835	5.43	2.19	31.54	61.77
15.0	0.850	5.53	2.26	31.77	46.71
15.5	0.865	5.62	2.33	32.01	39.30
16.0	0.880	5.72	2.41	32.23	35.71
16.5	0.889	5.78	2.45	19.44	30.77
17.0	0.898	5.84	2.50	19.52	25.13

17.5	0.907	5.90	2.54	19.59	22.34
18.0	0.916	5.95	2.59	19.67	20.99
18.5	0.925	6.01	2.63	19.74	20.35
19.0	0.934	6.07	2.68	19.81	20.06
19.5	0.943	6.13	2.72	19.88	19.95
20.0	0.952	6.19	2.77	19.95	19.94
20.5	0.958	6.23	2.80	13.34	18.29
21.0	0.964	6.27	2.83	13.37	15.82
21.5	0.970	6.31	2.86	13.40	14.60
22.0	0.976	6.34	2.89	13.43	14.01
22.5	0.982	6.38	2.92	13.46	13.72
23.0	0.988	6.42	2.95	13.48	13.60
23.5	0.994	6.46	2.98	13.51	13.55
24.0	1.000	6.50	3.01	13.54	13.54

II-60



HEAD FOR  
CONCRETE BOX CULVERTS  
FLOWING FULL  
n = 0.012